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On the optimality of Common External Tariffs in Africa: Evidence from the EAC Customs Union

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Abstract

We study the determination of a common external tariff by the East African Community (EAC). We use trade and tariff data at the HS6 level and a multi-sector multi-country computable general equilibrium model with the consistent tariff aggregator. We assume that the optimal common external tariff will keep three tariff bands and the same distribution of HS6 lines in these three bands as the current distribution. This common external tariff maximizes the total welfare of the region, calculated as the sum of the equivalent variations of each country's representative household. Compared to the current tariff bands, the optimal common external tariff implies less tariff dispersion and a higher average tariff. The common external tariff that maximizes the welfare of each member of the region is different: larger for Kenya, the largest country in the zone, and smaller for the other countries, including Rwanda, the smallest country in the zone. The adoption of this common external tariff is a Pareto-superior reform. However, if there is perfect mobility of factors between countries in the zone, divergence of interest about optimal trade policy is larger: if the optimal common external tariff which maximizes regional welfare is implemented, the GDP increases in the largest country, but it decreases in the smallest countries.

Keywords: Regional Economic Communities, Common External Tariff, Common Market, Mobility of Productive Factors

JEL classification: F11, F13, F15

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1. Introduction

Given the slow progress of multilateralism, more and more regional trade agreements (RTAs) are being negotiated. As of January 1, 2021, 305 of such agreements were in force. Among the RTAs, customs unions, which consist of freeing trade among members while imposing a common external tariff (CET) on outside members, have not been much analyzed. Yet the choice of the CET when forming a customs union is not obvious.

In Africa, four customs unions are in force: the Economic Community of West African States (ECOWAS), Economic and Monetary Community of Central Africa (CEMAC), the Southern African Customs Union (SACU) and the East African Community (EAC). Moreover, COMESA and ECCAS are moving towards a customs union structure.[1] The choice of the level of the CET for these regional economic communities (RECs) was in general the result of a political compromise between Member States although it is officially argued that it is designed to improve competitiveness, facilitate industrialization, and boost economic growth. In many cases it was not the result of a thorough assessment based on theoretical developments in the literature on customs unions. Therefore, the objective of this paper is to assess the optimality of the current CET structure for one customs union: EAC.

What does the economic literature tell us about this subject? It is indeed well known since the seminal works of Viner (1950), Lipsey and Lancaster (1956) and Lipsey (1957), that such an RTA is not necessarily welfare improving. This outcome is essentially given by second-best theory: facing one distortion (the CET), the removal of other distortions (internal tariffs of the union) can reduce welfare (Vousden, 2003). However, it has also been established since the work of Kemp and Wan (1976) that if lump-sum transfers are possible between members in the union, the CET can be chosen appropriately to set up a welfare-improving agreement.

Another issue is to determine not the optimal tariff for a customs union, but the economic agent that should oversee the trade policy of a group of countries: either one of the countries in the customs union or an agency with specific characteristics. Indeed, since Schelling (1960), it is well known that in a strategic game, the characteristics of a player modify the equilibrium of the game. Concerning trade policy, Gatsios and Karp (1991 and 1995) show that in a customs union with two countries, if tariffs are strategic substitutes the country which is relatively less well-endowed in the exported good may find beneficial to

[1] Also, following the African continental Free trade area (AfCFTA) one of the objectives of the African Union is the establishment of a continental customs union.

delegate to the other country, which behaves more aggressively when it sets the customs union's tariff. However, these results are especially sensitive to the specifications of the model: the delegation decision is reversed if tariffs are strategic complements (see also Collie, 1997; Bouët, 2000).

The objective of this paper is to estimate the EAC common external tariff, i.e. the common tariff that maximizes the welfare of the region and/or of each of its members. By comparing these different tariffs, we can not only assess whether the tariff currently implemented is optimal or not, but also highlight if the choice of the common external tariff is a bone of contention between EAC countries. Since the EAC is a common market, we also assess whether perfect factor mobility among member countries changes these results.

We focus on a single African customs union. Indeed, we design a new methodology that needs to be tested before application to other customs unions. Moreover, this methodology is time-consuming as it requires a detailed work on data: tariffs and trade at the Harmonized System 6 level.

Amongst African customs unions, the choice of EAC is straightforward. First, EAC is one of the most dynamic customs unions in Africa in terms of trade integration (Odjo et al, 2019). Second, it is amongst the three customs unions with few members: it has only six members (Burundi, Kenya, Rwanda, South Sudan, Tanzania, Uganda), as CEMAC (Cameroon, the Central African Republic, Chad, the Republic of the Congo, Equatorial Guinea, and Gabon), just a little bit more than SACU, with 5 members (Botswana, Eswatini, Lesotho, Namibia and South Africa), but much less than ECOWAS and its 15 members.[2] Third, we rely on the GTAP database for social accounting matrixes and EAC is the African customs union which is the best covered by this database: four over 6 countries are represented, while this ratio is eight over fifteen for ECOWAS, three over five for SACU, and one over six for CEMAC. Fourth, EAC offers a contrasting picture between large and small countries. In terms of Gross Domestic Product (GDP), Kenya is 27 times greater than Burundi and six times greater than Rwanda (see Table 1); Tanzania's population is 5.3 times greater than South Sudan's one and 5.3 times greater than Rwanda's one. The size of a country is supposed to be a key determinant of its influence on world prices of imported commodities, i.e. its price-elasticities of imports, which optimum tariffs depend on (Johnson, 1953). Moreover, South Sudan's degree of openness, measured as the ratio of trade (sum of exports and imports of goods and services) over GDP, is 2.3 times greater than Tanzania's one and 2.1 times than Kenya's one.

[2] Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

Table 1. EAC countries, descriptive statistics – 2020, except 2015 when *

	Burundi	Kenya	Rwanda	Tanzania	Uganda	South Sudan
GDP (Constant 2010 US$ blns)	2.4	64.9	11	56.6	43.8	7.8*
Population, total, mlns	11.9	53.8	13	59.7	45.7	11.2
Trade (% of GDP)	41.9	31	54	29	34	65.6*

Source: World Development Indicators, accessed on July 27, 2021

Our analysis is based on the MIRAGRODEP model. It is a dynamic multi-country multi-sector Computable General Equilibrium (CGE) model based on the MIRAGE (Modelling International Relations Under Applied General Equilibrium) model.[3] Given that our scenarios involve trade flows at the detailed (HS6) level, we pay a particular attention to the tariff aggregation procedure from the detailed level to the nomenclature of the model. To avoid endogeneity bias and capture properly the welfare impacts, we adopt the Consistent Aggregator Approach of Laborde et al. (2016). This approach is based on previous work by Anderson and Neary (2003) and Anderson and Neary (2005) and allows us to consider the variance of tariffs at the product level and it yields unbiased welfare estimates: this is a key aspect of our methodology due to the topic of this research. The Social Accounting Matrixes (SAM) and trade data in MIRAGRODEP are based on GTAP 10 (Aguiar et al., 2019).

We divide the EAC region into 5 countries/subregions (Kenya, Rwanda, Tanzania, Uganda, and Rest of EAC) and consider EAC as a bloc as well. We perform two series of simulations each consisting in selecting the optimal CET by maximizing a welfare function.

- The first simulation is entitled *delegation* and corresponds to the case where the choice of the country/sub-region is applied to the whole region (for example, Kenya selects the EAC's CET which maximizes Kenya's welfare, so trade policy is delegated to Kenya) or when the optimization is done at the regional level (a benevolent agent selects the EAC's CET which maximizes EAC's welfare, so trade policy is delegated to this benevolent agent).
- The second series of simulations (*unilateral*) consists in applying the choice of country c only to country c: for example, Kenya selects the Kenyan tariff which maximizes Kenya's welfare.

[3] See Bouët et al., (2022) for a complete documentation of MIRAGRODEP. MIRAGE is a CGE model devoted to trade policy analysis, developed at the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), Paris, between 2001 and 2004 (Bchir et al., 2002; Decreux and Valin, 2007). However, MIRAGRODEP has improved on MIRAGE in several ways.

For each scenario, we compare the outcomes with the current CET of EAC to highlight any discrepancy. A sensitivity analysis with different public closures is also performed.

This study provides several interesting results. The optimal common external tariff which maximizes regional welfare implies a decrease in tariff dispersion, and a higher average tariff. Common external tariffs preferred by each member differ from the one which maximizes regional welfare, and they differ from one country to another: larger for the large country, smaller for the others. The adoption of the common external tariff is a Pareto-superior reform. However, if there is perfect mobility of factors between countries in the zone, divergence of interest about optimal trade policy is larger: if the optimal common external tariff which maximizes regional welfare is implemented, the GDP increases in the largest country, but it decreases in the smallest countries.

The rest of the paper is organized as follows. Section 2 briefly depicts the state of play of the EAC customs unions and the structure of its CET. In section 3 we present the methodology adopted for the study (model and data) while section 4 focuses on the studied scenarios. The results are presented in section 5. Section 6 concludes.

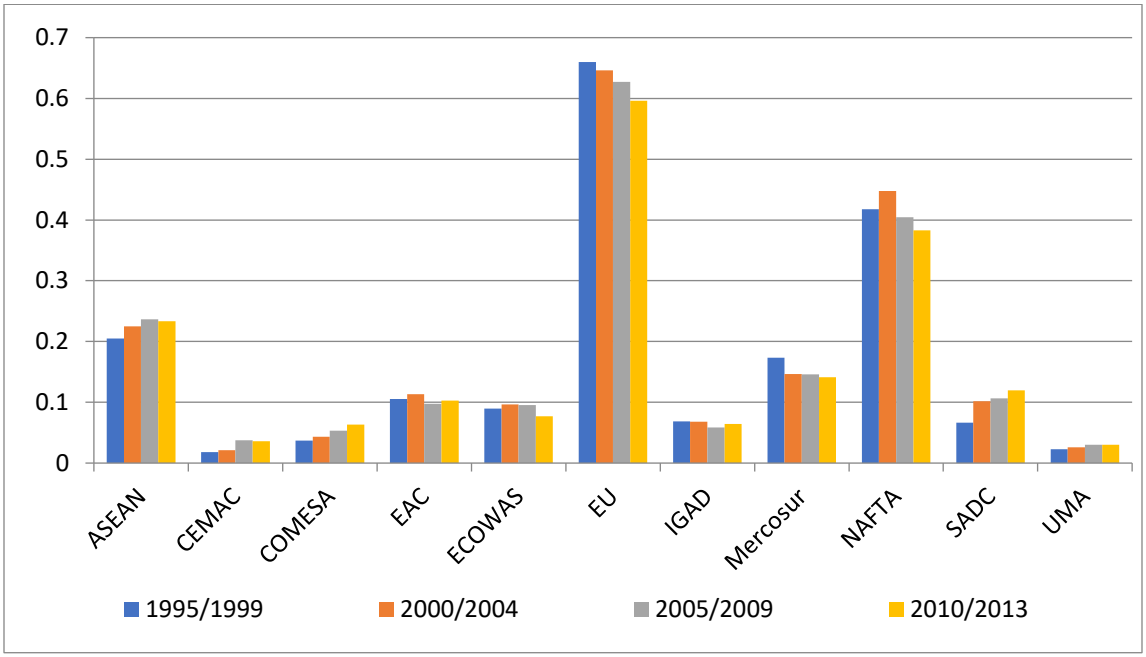
2. State of the play in EAC

The Eastern Africa Community was established in 1999 between Kenya, Uganda, and Tanzania to continue trading under COMESA preferential trade regime after Tanzania's withdrawal from the latter. The treaty entered into force in July 2000 and the community became a customs union in 2005. The three founding member states were joined by Rwanda and Burundi in 2008 and by South Sudan in 2016. The community is now a common market with free movement of labor and capital (protocol for the establishment of the EAC Common Market signed in 2009).

The EAC is one of the most dynamic RECs in Africa. The United Nations Economic Commission for Africa has designed an Africa Regional Integration Index (ARII), which is a composite index of sixteen indicators belonging to five dimensions: trade integration, productive integration, macroeconomic integration, infrastructural integration, and free movement of people. Weights are based on principal component analysis. In the last report for 2019, with 0.537, EAC has the highest score amongst all RECs, while the African continent has an average score of 0.327. Its best dimension is free movement of people. Kenya and Rwanda are ranked respectively second and third countries in terms of regional integration within Africa, while South Sudan is classified as the least integrated African country (see AU, AfDB and UNECA, 2019).

The simplest and most widely used indicator of regional integration is the share of intraregional trade in a region's total trade. Bouët, Cosnard and Laborde (2017) calculate average intraregional trade shares by regional agreement for four consecutive periods of five years (see Figure 1) for 11 trade agreements from Africa, America, Asia, and Europe. If in Africa, EAC is the regional agreement with the highest share of intraregional trade in total trade, except for the last period, all statistics relative to African RECs are significantly lower than those describing Asian, American, and European agreements.

Figure 1. Average intraregional trade shares by regional agreement

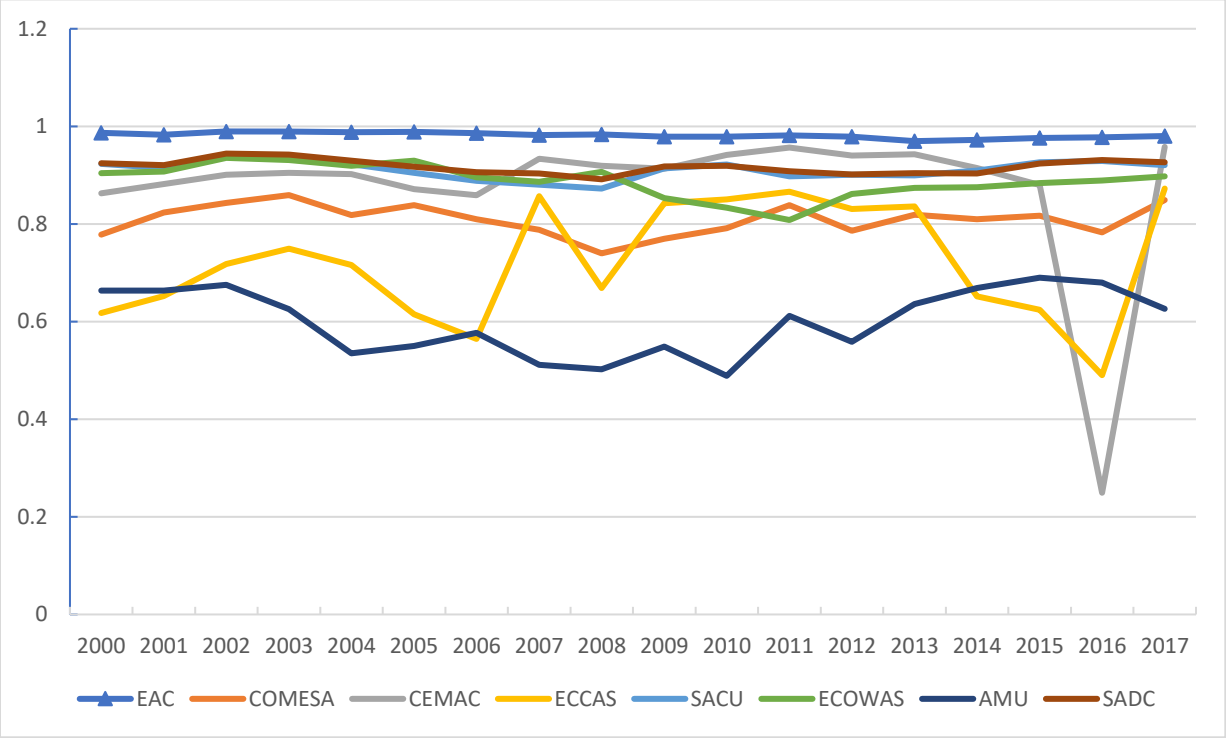


Source: Bouët, Cosnard and Laborde (2017)
Note: ASEAN = Association of Southeast Asian Nations; CEMAC = Central African Economic and Monetary Community; COMESA = Common Market for Eastern and Southern Africa; EAC = East African Community; ECOWAS = Economic Community of West African States; EU = European Union; IGAD = Intergovernmental Authority on Development; Mercosur = Mercado Común del Sur (Common Market of the South); NAFTA = North American Free Trade Agreement; SADC = Southern African Development Community; UMA = Union du Maghreb Arabe (Arab Maghreb Union)

However, the use of trade shares as an indicator of regional trade integration is clearly misleading for either cross-region or time-series comparisons: Trade shares depend not only on the degree of integration, but also on other factors, such as geography, competitiveness, and economic activity (OECD, 2005; Iapadre and Luchetti, 2010). As highlighted in Figure 2 below, when using a regional trade introversion index, which is a more consistent indicator of regional trade integration than the share of intraregional trade (Bouët, Cosnard, and Laborde, 2017), it is concluded that EAC is the most introverted

REC in Africa over the past two decades.[4] Moreover this pattern has remained stable over the entire period under consideration.

Figure 2. Evolution of the regional trade introversion index by REC



Source: Authors' calculations from COMTRADE and Africa Agricultural Trade Monitor (AATM, 2020).

Note: CEMAC = Central African Economic and Monetary Community; COMESA = Common Market for Eastern and Southern Africa; EAC = East African Community; ECOWAS = Economic Community of West African States; IGAD = Intergovernmental Authority on Development; SADC = Southern African Development Community; AMU = Arab Maghreb Union.

The CET structure of EAC is simple: it consists of 3 bands as indicated by Table 2. Three tariffs taxes imports of different groups of products according to the stage of transformation.

Table 2. Structure of EAC common external tariff

Percentage of duties	Goods description
0%	Raw materials and capital goods
10%	Semi-processed goods and inputs
25%	Finished goods

Source: EAC Secretariat

[4] The regional trade introversion index measures the intensity of regional trade introversion. It is symmetric and independent from the size of the region, and it increases only if intraregional trade grows more quickly than extraregional trade (Iapadre and Luchetti 2010; Hamanaka 2015). It corrects the bias of intra-regional trade shares.

As in many customs unions, inputs and raw materials are not taxed or at a low rate (10%) while finished products are subject to the highest rate. In addition, there exists a list of sensitive products subject to tariffs of 35% or above. In 2020, Uganda proposed to move to a 5-band structure of the CET with the introduction of an additional 5% band for products that were subject to minimal transformation and a 35% band for a selected list of sensitive finished products. As a comparison, ECOWAS and CEMAC CETs consist of 4 and 5 bands respectively. They all share similar characteristics, exempting or taxing at a low rates raw materials and capital goods while using high rates for finished products. SACU has implemented a more complex common external tariff structure.

It is worth noting that EAC member states are supposed to join COMESA customs union which was launched in 2009 and not yet operational. The Common External Tariff (CET) rates for the future customs union (COMESA) are set according to a tariff structure like that of EAC: 0% for raw materials and capital goods, 10% for intermediate products and 25% for finished products.

Like other customs unions in the continent, there is no evidence that EAC CET was selected based on a welfare criterion. Officially, it was stated by governments that the objective relates to economic growth and food security considerations. Yet political economy reasons might also have been present. It is therefore important to analyze to what extent this choice might coincide or come close to a maximum welfare criterion for the bloc.

3. Methodology

3.1. Model

The study uses MIRAGRODEP, a recursive dynamic multi-region, multi-sector model. As opposed to a single-country CGE model, a multi-country CGE model allows for a detailed and consistent representation of economic and trade relations with the rest of the world. International economic linkages are captured through the international trade of goods. A dynamic version of the model is used by solving the model sequentially and moving the equilibrium from one year to another. In this paper, we assume perfect competition in all sectors, which enables us to have a detailed geographic and sector decomposition.

In MIRAGRODEP, the government is explicitly modelled as different from private agents. Government income consists of taxes collected on production, on factors of production, on exports, on imports, on consumption, and on households' income. The government is supposed to maximize a Cobb-Douglas

utility function: government spending on each commodity is a fixed share, in value, of total public expenditure in goods and services. Government purchases are subject to taxes.

Households are assumed to be homogenous, and they own all factors of production. They, hence, receive all the payments made to factors of production. Households' demand is characterized by a LES-CES (Linear Expenditure System - Constant Elasticity of Substitution) specification. This specific utility function allows the evolution of the demand structure of each region to be accounted for as its income level changes: income-elasticity of final consumption is not unitary.

The production in each sector and in each region follows the following nested structure. At the top level, total output is a Leontief of total value added and of total intermediate consumption. In other words, there are no substitution possibilities between the two aggregated inputs, they are used in perfect complementarity, and thus their volume shares in total production in volume are constant. At the second level, on the value-added side, total value added is a combination of unskilled labor, land, natural resources, and a capital-skilled labor bundle. It is assumed that these inputs are imperfect substitutes for one another, which is represented through a constant elasticity of substitution (CES) function. Capital and skilled labor are combined through a CES function, once again to represent the imperfect substitutability between the two factors of production. The five primary factors of production are not at the same level of the nested production function. This allows different degrees of substitutability between factors: the idea is to simulate the possibility of replacing unskilled labor with a combination of capital and skilled labor. Total factor productivity is differentiated by country and sector and is determined endogenously in the baseline to make Gross Domestic Products in each country equal to the World Bank's predictions. On the intermediate consumption side, the commodities used in the production process are assumed to be imperfect substitutes.

The model includes four important assumptions: the external account closure, the private account closure, the government account closure and the factor market closure.

The private account closure assumption concerns the savings-investment closure. The MIRAGRODEP model is Neo-Classical: the marginal propensity to save is constant such that variation in income leads to variation in savings, which brings variations in investment.

The external account closure concerns the assumption on the current account. It is usual to suppose that the real exchange is affected by the reform in such a way that the current account balance is constant, and the adjustment of the real exchange rate takes place through different evolutions of domestic prices

in the different regions. Indeed, MIRAGRODEP does not model financial markets and a welfare analysis of the reform is not biased.

The government or public account closure assumption concerns how the public balance is affected when taxes are changed by a shock or a reform. In this paper, we assume that each government maintains the public balance constant and that after a shock that impacts custom duties, a consumption tax (VAT) is adjusted to maintain real public expenses per capita constant while public sold is constant in percentage of GDP. With this assumption, the level of public services in each country is constant and there is no variation of public sold and no associated crowding-out effect on private investment.

Finally, we considered different scenarios of factors markets integration. Regional factors mobility can significantly change simulation results in trade related models. Indeed, trade in goods and factors markets integration (mobility of factors) have complex relationships as they can be substitute or complements (Ohlin, 1933; Mundell, 1957; Jones and Neary, 1984; Markusen and Svensson, 1985). While the central scenario includes an assumption of international immobility of productive factors (see subsections 5.1 and 5.2), we also considered a scenario with full integration (labor, capital and current account): see subsection 5.3.

One important feature of the model is the Consistent Tariff Aggregator approach[5]. This is an important element of the model when it comes to trade shocks scenarios since the simulations will be conducted at a relatively low level of sector disaggregation (25 sectors). The Consistent Tariff Aggregator approach allows us to capture the exclusion effects and the variance of tariffs at a detailed (tariff line) level. Not considering this approach would yield inconsistent welfare effects since simple trade weights are endogenous and the welfare changes induced by a tariff is a function of it powers, not its level per se.

3.2. Data

Social Accounting Matrix (SAM) and trade data in MIRAGRODEP is based on GTAP 10 (Aguiar, Narayanan, and McDougall, 2018). The GTAP 10 database is a fully documented global database which contains complete bilateral trade information, transport, and protection data among 140 countries or regions for all 57 GTAP commodities for 2014. The GTAP 10 database contains the social accounting matrices for 33 African countries or regions. The 26 individual countries represent more than 74% of the continent GDP, 72% of its exports and 77% of its imports (AFDB-AUC-UNECA, 2018).[6] In addition to GTAP, IMF financial

[5] See Laborde et al. (2016) for the importance of tariff aggregation in studying trade liberalization scenarios.
[6] African Development Bank Group, African Union Commission & Economic Commission for Africa (2018).

reports are used for effective tariff and tax revenue data (IMF Government Finance Statistics and article IV review). Finally, macroeconomic forecasts are based on IMF World Economic Outlook projections.

3.3. Sector and geographic disaggregation

We adopt a 24 sectors/16 regions disaggregation. Sector disaggregation is presented on Table 3, while geographic disaggregation is provided by Table 4. There are 9 agricultural and food sectors, plus fisheries, forestry. There are four sectors of services, which are not concerned by tariff liberalization.

Table 3. Sector disaggregation

#	Model sector	GTAP sector	Label
1	BevTobacco	b_t	Beverages and Tobacco
2	Cgoods	ele, omf	Manufacture of computers and electronic products, furniture
3	chm	chm, bph, rpp	Chemical products, pharmaceuticals, rubber and plastics
4	Dairy	rmk, mil	Dairy
5	Energy	coa, oil, gas, p_c, ely, gdt	Energy
6	Fisheries	fsh	Fisheries
7	Forestry	frs	Forestry
8	Igoods	nmm, i_s, nfm, fmp	Manufacture of metal and mineral products
9	Kgoods	mvh, otn, eeq, ome	Vehicles and parts, Machinery and electrical equipment
10	Meat	ctl, oap, wol, cmt, omt	Animals and animal products
11	NBSERV	ros, osg, edu, hht, dwe	Arts, Public Administration, Education, Health and social work
12	OthCrops	c_b, pfb, ocr	Other crops
13	othFood	vol, ofd	Vegetables oils and fats, Other food products
14	Paper	ppp	Paper products, publishing
15	Primary	oxt	Mining
16	Rice	pdr, pcr	Rice
17	SERV	wtr, cns, afs, cmn, whs, ofi, ins, rsa	Services
18	Staples	wht, gro, osd	Staples
19	Sugar	sgr	Sugar
20	TRAD	trd	Trade
21	TRAN	otp, wtp, atp	Transport
22	VegFruits	v_f	Vegetables, fruit, nuts
23	WearApp	tex, wap, lea	Wearing, Apparel, Leather products
24	Wood	lum	Wood products

Source: authors' elaboration

The model is run with 16 regions, of which 10 are African: four EAC countries (Kenya, Rwanda, Tanzania, Uganda), plus the two other EAC countries (Burundi and South Sudan) included in a single region called EAC_OTH.[7] The other 5 African regions are two RECs (CEMAC and ECOWAS) and 3 regions (Eastern Africa,

[7] This EAC_OTH region corresponds to the GTAP region, XEC, which includes not only Burundi and South Sudan, but also Comoros, Djibouti, Eritrea, Mayotte, Seychelles, and Sudan. All these countries are tiny, except Sudan. Another modelling option would have been to exclude XEC from the modelling of the EAC region.

Northern Africa, Southern Africa). Indeed, it is difficult, if not impossible, to design a geographic disaggregation in Africa, uniquely based on RECs due to the overlapping membership issue.

Table 4. Geographic disaggregation

#	Model Code	Label	GTAP regions
1	AFRICAEAST	East of Africa	ETH, MDG, MOZ, MUS, MWI, ZMB, ZWE
2	AFRICANORTH	North of Africa	EGY, MAR, TUN, XNF
3	AFRICASOUTH	South of Africa	BWA, NAM, ZAF, XSC
4	AMERICA	America	ARG, BOL, BRA, CAN, CHL, COL, CRI, DOM, ECU, GTM, HND, JAM, MEX, NIC, PAN, PER, PRI, PRY, SLV, TTO, URY, USA, VEN, XNA, XSM, XCA, XCB, XTW
5	ASIA	Asia	BGD, BRN, CHN, HKG, IDN, IND, JPN, KHM, KOR, LAO, LKA, MNG, MYS, NPL, PAK, PHL, SGP, THA, TWN, VNM, XEA, XSE, XSA
6	CEMAC	CEMAC	CMR, XCF, XAC
7	CIS	CIS	ARM, AZE, GEO, KAZ, KGZ, RUS, SRB, TJK, UKR, XEE, XER, XSU
8	EAC_KEN	Kenya	KEN
9	EAC_OTH	Other EAC	XEC
10	EAC_RWA	Rwanda	RWA
11	EAC_TZA	Tanzania	TZA
12	EAC_UGA	Uganda	UGA
13	ECOWAS	ECOWAS	BEN, BFA, CIV, GHA, GIN, NGA, SEN, TGO, XWF
14	EUROPE	Europe	ALB, AUT, BEL, BGR, BLR, CHE, CYP, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, HRV, HUN, IRL, ITA, LTU, LUX, LVA, MLT, NLD, NOR, POL, PRT, ROU, SVK, SVN, SWE, XEF
15	MEAST	Middle-East	ARE, BHR, IRN, ISR, JOR, KWT, OMN, QAT, SAU, TUR, XWS
16	OCEANIA	Oceania	AUS, NZL, XOC

Source: authors' elaboration

4. Scenario's design

We consider two types of scenarios. Let us note r an EAC country ($r \in \{KEN; RWA; TZA; UGA; Oth\}$), t_r^k the tariff that country r applies on band k, and t_{CET}^k the tariff that the EAC customs union applied on band k. Let W_r be the welfare of country r; W_{EAC} the welfare of EAC: $W_{EAC} = \sum_r W_r$.

- In a unilateral scenario, each EAC country chooses its own optimal tariffs t_r^k that maximize its own welfare W_r while other EAC countries keep the initial tariff structure. These scenarios are called r_UN with $r \in \{KEN; RWA; TZA; UGA; Oth\}$. So, there are 5 r_UN scenarios.
- In a delegation scenario, each EAC country chooses EAC's common external tariffs t_{CET}^k that maximize its own welfare W_r. These scenarios are called r_DE with $r \in \{KEN; RWA; TZA; UGA; Oth\}$. So, there are 5 r_DE scenarios.

- In the EAC scenario, a central institution chooses EAC's common external tariffs t_{CET}^{k} that maximizes EAC's welfare, W_{EAC} .

It gives us 11 scenarios. It is important to note that the term delegation is different here from the one used in game theory (see introduction).

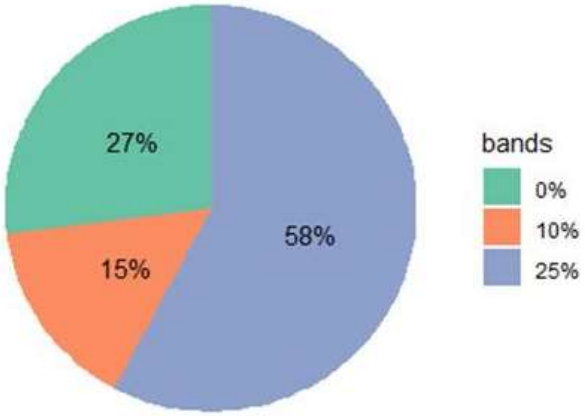
As EAC is a common market, we also compute optimal common external tariffs when productive factors (capital and labor) are perfectly mobile between EAC countries.

5. Results

Before presenting the results on optimal tariffs by band, we provide some indications of the structure of imports and the tariff schedule of the EAC. The first band, characterized by a zero tariff, covers only 27% of the EAC's merchandise imports, while the highest tariff taxes 58% of the customs union's imports (Figure 3).

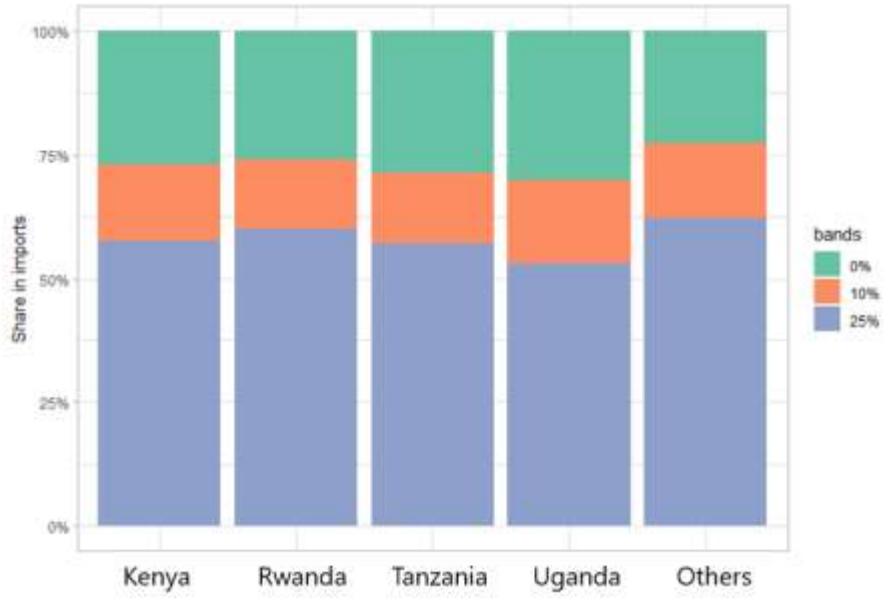
This distribution of imports is roughly the same for all countries of this REC (Figure 4). Note that for Uganda, the share of imports taxed at 25 percent is slightly lower and those entering untaxed is slightly higher.

Figure 3. Distribution EAC's imports by band



Source: AATM and authors' calculation

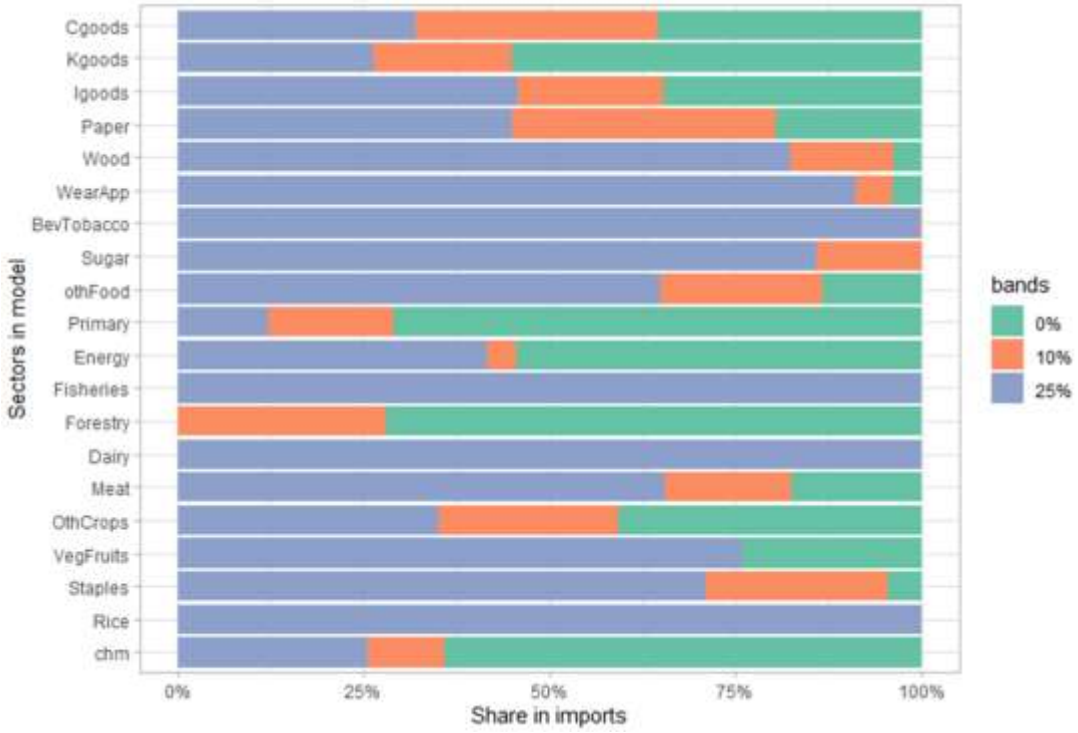
Figure 4. Distribution of imports by band and country



Source: AATM and authors' calculation

Figure 5 indicates the distribution of EAC's extra-regional imports by band for each sector.

Figure 5. Distribution of imports by band for each sector



Source: AATM and authors' calculation

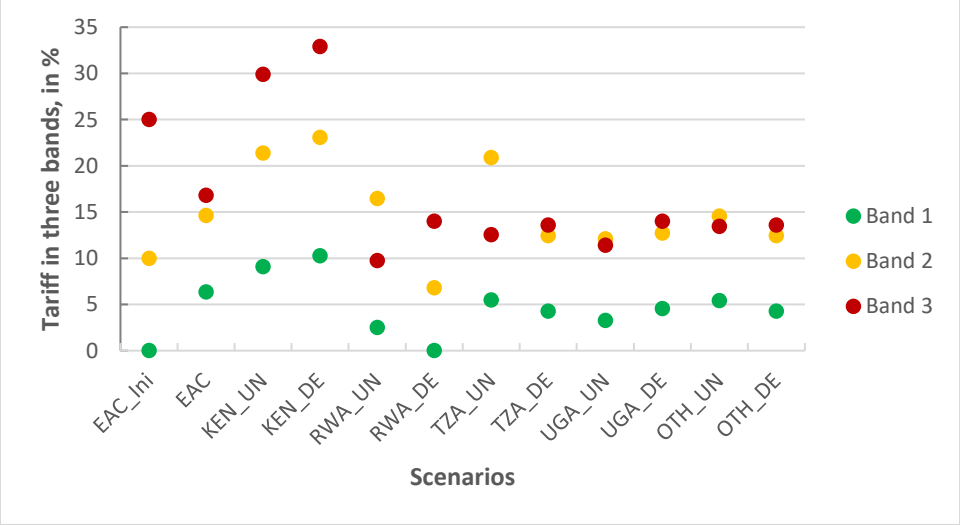
It is important to note that all extra-regional imports of essential products such as rice, dairy products, and fishery products are taxed at 25%. This should have a cost in terms of welfare for households in the region

5.1. Optimal tariffs value for each band

Based on this approach, the model provides us optimal tariffs for each band. Figure 6 shows these optimal tariffs under the 11 scenarios presented earlier.

First if we compare the initial structure of the common external tariff (EAC_Ini) to the one adopted by an agent maximizing EAC's total welfare (EAC), we see that from the initial 3 bands structure {0%;10%;25%}, we move to {6.4%; 14.6%; 16.8%} new band structure: weighted by initial EAC imports (see Figure 3), the average is slightly reduced from 16.0% to 13.7%, but the standard deviation is divided by 2.5: from 11% to 4.5%. It implies a significant convergence of the three bands. Reducing tariff heterogeneity seems to be an important feature of the welfare maximization for the customs union. Indeed, economic theory explain that welfare losses associated with a tariff structure are increasing with the square of tariffs. Moreover, if tariffs are initially implemented not only to increase welfare, but also to increase public revenues, a motive often stated by African policymakers, it makes sense to reduce both average and variance of tariffs when the unique objective is welfare maximization.

Figure 6. Optimal common external tariffs



Source: MIRAGRODEP and authors' calculation

Second, let us now compare tariff bands when an EAC welfare-maximizing agent selects EAC trade policy, to those (EAC) when this is either a Kenyan welfare-maximizing agent who does it (KEN_DE), or a Rwandan one (RWA_DE), or a Tanzanian one (TZA_DE), or a Ugandan one (UGA_DE). The tariffs taxing the three

bands are increased when this is Kenya which decides, while they are decreased under other scenarios, especially in the case of Rwanda. Kenya is by far the largest economy in this group: according to the WTO profiles, it is the 83th importing country amongst WTO members with a 2018 GDP (PPP 2010) of 227 US$ blns, a GDP per capita of 4,330 and a population of 54 mlns inhabitants (these figures are from the CIA factbook). Rwanda is the smallest country amongst the four countries considered here: 153th importing country amongst WTO members, a GDP of US 28 $ blns (PPP 2010), a GDP per capita of 2.227 US$, and a population of 12 mlns. Tanzania and Uganda can be considered as intermediate economies.[8] According to economic theory, largest economies have a greatest monopsony power on world markets, and as such, their optimal tariff used to be higher.

Calculating the average protection (trade weighted, base year trade values, excluding intra-regional trade flows), we confirm that while the average tariff at the EAC level resulting from the selection of tariff bands by an EAC welfare-maximizing agent is 12.8% (while the current average tariff of EAC is 13.8%), the one decided by Kenya would be 23.4%, and only 7.9% if it is Rwanda which decides. Average tariffs at the EAC level when Tanzania and Uganda are deciders are less than when EAC's welfare is maximized, but greater than the one when Rwanda's welfare is maximized.

Moreover, from Figure 6, we see that for Kenya and Uganda, the three optimal common external tariffs selected by each country (scenarios DELEGATION) are greater than optimal national tariffs (scenarios UNILATERAL). The same remark holds for one optimal tariff amongst three for Rwanda and Tanzania. When one country decides the regional tariffs, in the *Delegation* case, it can include the gains from the regional adoption, and therefore an additional terms of trade effects takes place. This remark is especially relevant in the case of Kenya, where each unilateral tariff is slightly smaller than each delegation tariff.

This is more complicated in the case of Rwanda: for this country, each unilateral tariff is smaller than each delegation tariff, but we also notice an inverted order between bands 2 and 3 in the unilateral scenario. This inversion of order between bands 2 and 3 in the unilateral scenario also appears for Tanzania and Uganda.

[8] It is true that Tanzania's population is higher than Kenya's population but all other statistics confirm this assertion. Tanzania is the 105th importing country amongst WTO members; its GDP (PPP 2010) is 149 blns US$; its GDP per capita is US$ 2.660 and its population is 62 mlns. Uganda is the 110th importing country amongst WTO members; its GDP (PPP 2010) is US$ 96 blns; its GDP per capita is 2.187 per capita and its population is 44 mlns.

When a tariff is implemented by a country on a specific product, there are two effects: one positive and one negative. The positive one is the terms of trade effect: an increasing tariff starting from 0 reduces the world price of this good, bringing an improvement in terms of trade for this country. This positive impact is relatively bigger in case of large country like Kenya, but weaker in case of small countries like Rwanda, Tanzania and Uganda. Moreover, this effect is smaller when the tariff applies only at the national level compared to a common external tariff applied at the REC level.

The negative impact comes from an allocative inefficiency: local consumers are evicted from this market because the local price of this good increases, and consumers who still buy this good, pay it at a higher price. This negative impact is especially strong in case of essential goods for which local demand for imports is inelastic. As mentioned earlier, band 3, with usually the highest tariff, taxes extra-regional imports of key commodities like rice, dairy products, and fishery products. So, when deciding national tariffs (scenarios RWA_UN, TZA_UN, and UGA_UN), it may make sense to decrease this tariff on band 3, and increase tariffs on bands 1 and 2. This has several positive implications: a double reduction effect on tariff dispersion (via the levels of the three tariffs, and via the reduction of the tariff taxing the largest share of imports); a reduction of allocative inefficiency losses on key imports; and increased terms of trade gains from augmented tariffs on band 1 and 2.

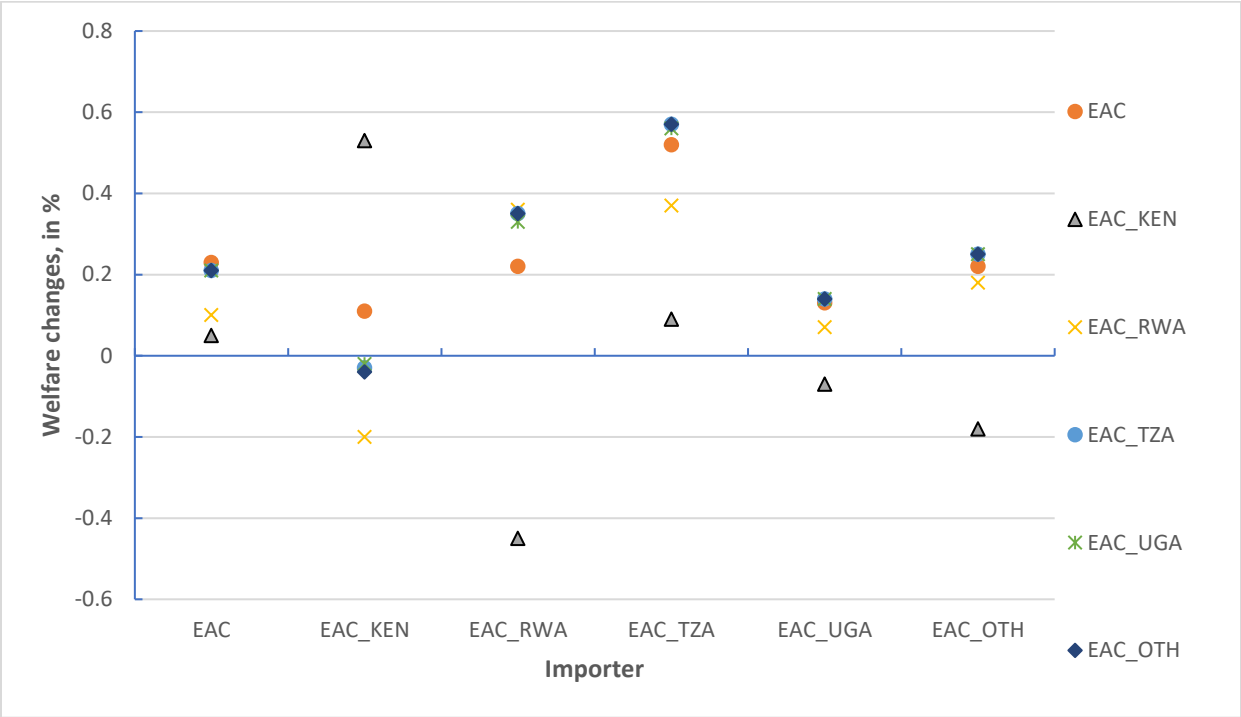
5.2. Impacts on welfare

Figure 7 presents how welfare is modified thanks to the implementation of these various scenarios. Welfare is measured by the equivalent variation of the representative household. At the EAC level, it is obtained through a sum of the welfares of each country. In each scenario, the welfare is compared to the initial situation.

The results are consistent with expectations: for EAC and for each country r, the highest welfare augmentation is obtained when respectively EAC and country r selects the common external tariffs.

Interestingly, when common external tariffs are selected by an agent maximizing the EAC welfare, it brings a higher welfare than the initial situation (see orange dots for each importer): the agreement is Pareto-improving.

Figure 7. Rates of variation of welfare associated with all scenarios



Source: MIRAGRODEP and authors' calculation

However, in each case, if the selection has been done at the country level, adoption of common external tariffs would have implied a larger welfare augmentation than if the selection is done at the regional level. To see this, compare the country r's welfare variation when r selects the common external tariffs, to country r's welfare variation when EAC selects the common external tariffs: in case of Kenya, the former scenario gives Kenyan representative household a 0.53% increase of welfare, while the latter gives a mere 0.11% increase.

Last, not least, when Kenya, the largest country, selects the common external tariffs, it is the worst situation for the smallest country, Rwanda. And when Rwanda, the smallest country, selects the common external tariffs, it is the worst situation for the largest country, Kenya.

5.3. Factors markets integration

We now take the analysis one step further. Indeed, the EAC is a common market: there is free movement of capital and labor between the countries of this regional agreement. We therefore study the same problem as before, i.e. the determination of optimal national or regional tariffs in the EAC, assuming now that the factors of production, capital, skilled labor and unskilled labor, are perfectly mobile.

What can we expect from this new specification of the model? From a theoretical point of view, in international economics, a nation is initially defined as a maximum zone of factor mobility. The international immobility of factors of production is a factor of inefficiency and, under certain conditions, free trade is a perfect substitute for the international mobility of productive factors: this is Mundell's theorem.[9] Obviously, the model used here, which is more in line with economic reality, does not respect all the conditions for applying this theorem: in particular, there is an Armington hypothesis according to which goods are differentiated according to their place of origin, and there is one factor whose intersectoral mobility is reduced: land. Moreover, there are many distortions: consumption taxes, incomes taxes, import tariffs, …

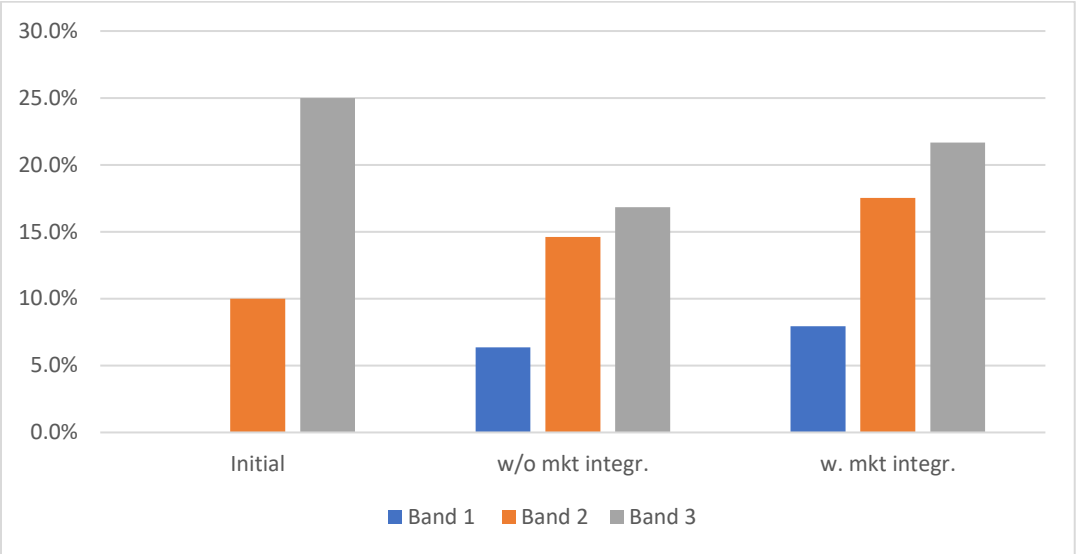
Nevertheless, we should expect the assumption of perfect mobility of factors of production within the EAC countries to result in greater productive efficiency in this zone.

Figure 8 indicates the optimal common external tariffs with and without the productive factor market hypothesis. We also include the initial tariffs within the three bands. We only consider the EAC scenario. Indeed, variation of welfare at the national level is difficult to interpret: with movement of labor across countries implying a modification of national productive capacities, the budget constraint of households is modified, while populations of each country are unchanged. Consequently, national welfare variations are difficult to interpret. However, at the regional level, total population is constant and total labor force and capital are the same. It is much easier to interpret an agent maximizing the welfare of the zone and the implied variation of GDP and welfare. We can also interpret the variation of national GDP, as movement of labor and capital from country r to country s will have a negative impact on country r's GDP and positive on country s's GDP.

From Figure 8, under the hypothesis of productive factor mobility, the EAC zone has higher common external tariffs in all three bands. We can interpret this result: a more efficient country is equivalent to a larger country, with augmented factor endowment. Consequently, its monopsony power on world market is larger and its optimal tariff is higher. Its welfare gain from imposing an optimal common external tariff is also larger: from US$ 0.83 blns to US$ 1.41 blns.

[9] "Commodity movements and factor movements are substitutes. The absence of trade impediments implies *commodity*-price equalization and, even when factors are Immobile, a tendency toward factor-price equalization. It is equally true that perfect factor mobility results in factor-price equalization and, even when commodity movements cannot take place, in commodity-price equalization" (Mundell, 1957).

Figure 8. Optimal common external tariffs with and without factor market integration

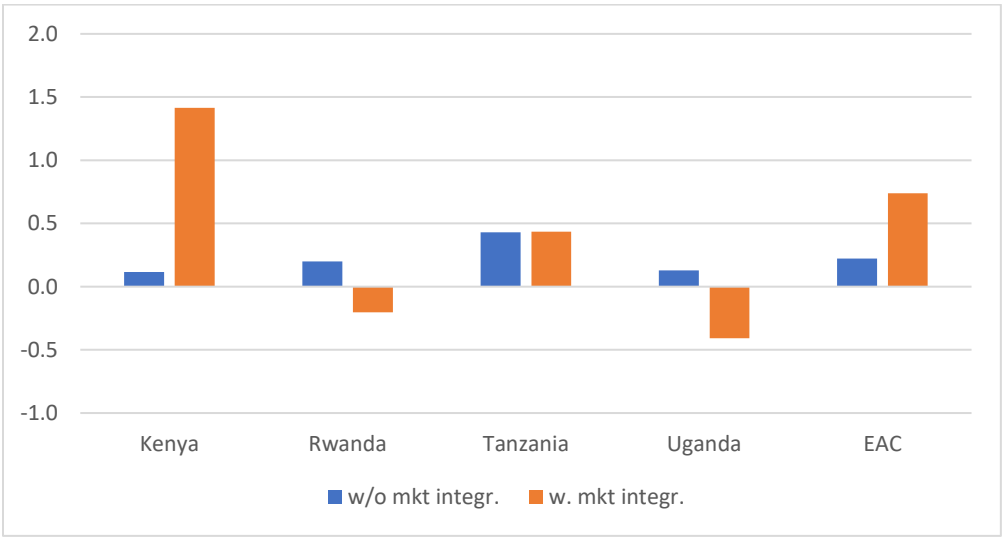


Source: MIRAGRODEP and authors' calculation

Note: w/o mkt integr. stands for without factor market integration; w. mkt integr. stands for with factor market integration.

Figure 9 presents the impact in terms of GDP.

Figure 9. GDP changes from a Common External Tariff, with and without factor market integration



Source: MIRAGRODEP and authors' calculation

Note: w/o mkt integr. stands for without factor market integration; w. mkt integr. stands for with factor market integration.

Indeed, the factor market integration hypothesis makes the EAC zone stronger from an economic point of view: the augmentation of regional real GDP coming from the adoption of a common external tariff is 0.7% instead of 0.2%. Kenya is the beneficiary of the adoption with capital and labor moving from Rwanda and Uganda to the largest economy of the zone. The augmentation of Kenya's GDP is 1.4% instead of 0.1% without a factor market integration hypothesis, while Rwanda's GDP decreases by 0.2% (instead of an increase by 0.2%) and Uganda's one by 0.4% (instead of an increase by 0.1%). For Tanzania, the impact on GDP is unchanged: + 0.4%.

6. Conclusion

The purpose of this paper was to study the determination of a common external tariff for African customs unions, using the case of the EAC. The study was based on an original methodology: we used trade and tariff data at the HS6 level and a multi-sector multi-country computable general equilibrium model with the consistent tariff aggregator. We assume that the optimal common external tariff will keep three tariff bands and the same distribution of HS6 lines at these three bands as the current distribution. The availability of detailed data allows us to keep detailed information to feed the model, and thus to make more accurate estimates. We also highlight the difficulty of determining an optimal structure of common external tariffs depending on whether we suppose that the welfare of the whole area is maximized, or the welfare of a specific country is. We also highlight what impact a perfect mobility of production factors between countries of the REC can have on this choice.

We obtain many interesting results. Compared to the current tariff bands, the optimal common external tariff implies less tariff dispersion and a higher average tariff. This common external tariff maximizes the total welfare of the region, but the common external tariff that would have maximized the welfare of each member of the region would have been different: larger for Kenya, the largest country in the zone, and smaller for the other countries, including Rwanda, the smallest country in the zone. However, the adoption of this common external tariff increases the welfare of each country, but it "generates frustration": the adoption of a common external tariff would have increased the welfare of each country even more if it corresponded to a maximization of the welfare of each country. For some countries, such as Kenya, this "frustration" may be significant. Finally, we show that if the international mobility of labor and capital production factors is perfect between countries in the zone, the optimal common external tariffs of all bands are higher, the implied welfare and GDP of the zone are greater. However, this is at the expense of small countries (Rwanda, Uganda) and to the benefit of the largest (Kenya).

This work can be easily extended to other existing customs unions (ECOWAS, CEMAC, SACU) and ongoing ones yet to be fully operational (COMESA and ECCAS). We can also imagine a study in a strategic context,

inspired by game theory, where countries determine their optimal tariff structure relatively to existing trade policies adopted by others. A delegation game could identify if the selection of trade policy must be given to a specific country, the largest one or the smallest one. These are important areas of research that we will pursue soon.

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